Title:	2019 Megasun Illumination System Modifications and Operating Procedure Updates
Author(s):	Esquibel, Brian David
Intended for:	Webex Meeting
Issued:	2021-03-31

2019 MegaSun Illumination System

Modifications and Operating Procedure Updates

Brian Esquibel

M-3 ESO

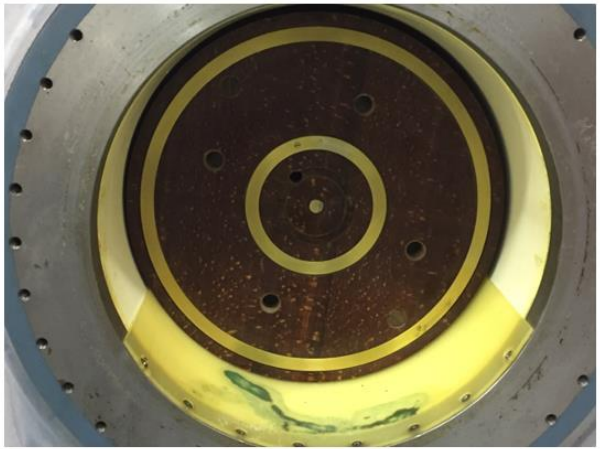
12/30/20

Los Alamos NATIONAL LABORATORY EST. 1943

NNSA National Nuclear Security Administration

Managed by Triad National Security, LLC for the U.S. Department of Energy's NNSA

Why Did we Change our Operation?



- May 2019 Febetron Shock Incident
- Worker was following procedure
- The X-ray pulser was undergoing maintenance due to multiple malfunctions
- After meeting with Occupational Medicine, the worker was allowed to come back to work without restrictions

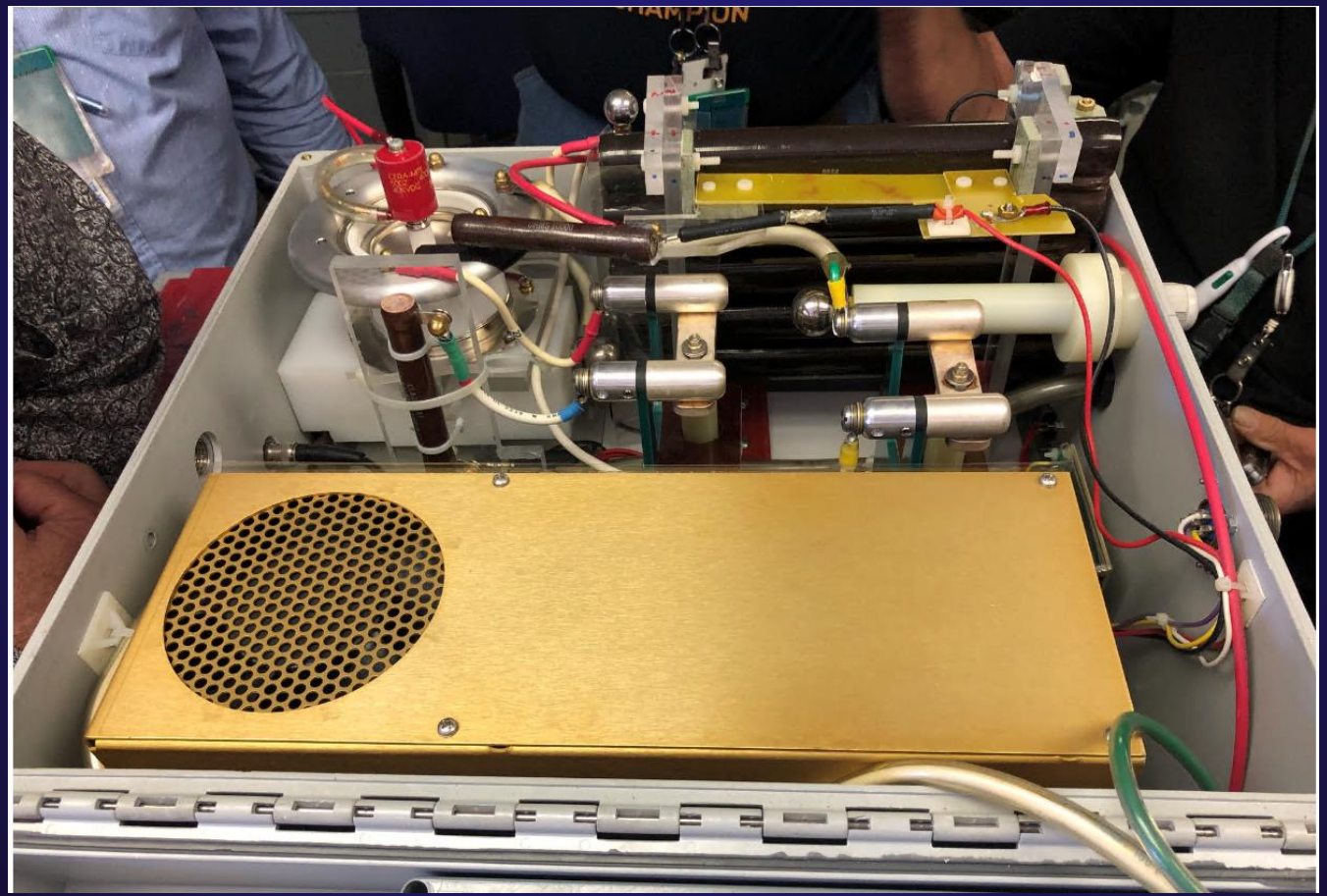
Los Alamos NATIONAL LABORATORY EST. 1943

Group Wide “Pause Work” Initiated

Los Alamos
NATIONAL LABORATORY
EST. 1943

- New Goal: Identify gaps in our operating procedures that may pose a potential hazardous situation
- Cover non-routine situations in new hazard analysis discussions
- Add lessons-learned sections with detailed accounts of abnormal conditions to all work procedures.

So How Does This Affect the MegaSun?

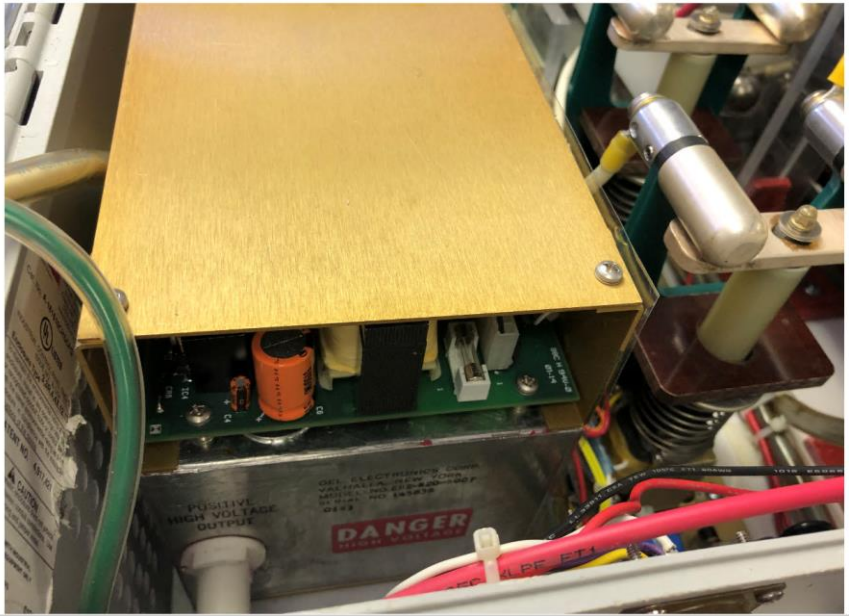


The Original MegaSun (2001 System)

- The original operating procedure was nearly 20 years old, though it was on a semi-annual review schedule. Some electrical categories had changed, as well as their risk management assessments. The IWD did not reflect these updated guidelines.
- No injuries have been reported during nearly 20 years of operation (not a bad record), however, several abnormal conditions came to surface during our Hazard Analysis conversations. One of which included an oil based capacitor malfunction which cracked it’s housing and leaked oil within the 2001 system.
- Our training and qualifications were updated to reflect LANL’s current standards

Walk-down with SME's and ESO's

- After discussion on the schematics given by the manufacturer, we decided to open up the cabinets, starting with the 2001 design.

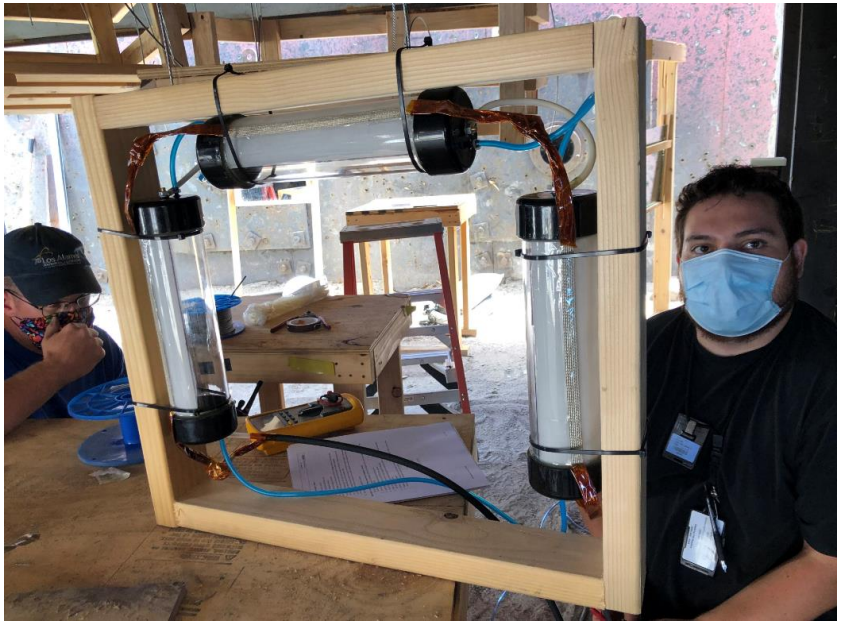


The Findings

- More than 8 ESO's from various divisions, including the head of our Electrical Safety Committee were present during the walk-down.
- Somewhere along the way, the 2001 system had been modified. It no longer had a "hard short" on one of the 2 ross relays, which remove energy from the system via facility ground. Instead, a resistor was placed inline with the path to ground.
- This design was lacking a HV Output Disable Pin
- Modifications would need to be made in order to operate this model within the guidance of its hazard class, defined by the LANL Electrical Safety Committee

The 2019 System Autopsy

- Our newest system was better suited for operation after only a few modifications, including:
  - » Extending the Handle of the HV Output Disable Pin so it extends past the RAB
  - » Isolating the HV connection to the RG-13 by placing it in a clear dielectric enclosure
  - » Changing our OP to include zero energy verification is done using a combination of the Ross relays and front panel voltmeter
  - » Updating our labeling of LAB's and RAB's as well as Haz Class stickers on both sides of the cabinet



An Ongoing Process

Los Alamos
NATIONAL LABORATORY
EST. 1943

- Each time we pulse, we pay more attention to any clues that might alert us to a malfunction.
- Pulsed power has a tendency to not work 100% of the time. It is important to document any abnormal events to help better understand what caused them.
- Safety is paramount! Keep an eye on complacency, especially during repetitive operations.